

SINGLE-EVENT EFFECTS TEST REPORT

**Radiation Hardened, Dual 10 Amp, DC, Buffered Solid-State Relay
in Hermetic Packages (OMR9701) manufactured by
Omnirel (a division of International Rectifier)**

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1. Devices

The OMR9701 is a radiation-hardened dual solid-state relay manufactured by Omnirel (a division of International Rectifier). Fig 1. shows a block diagram of the components in the OMR9701 consisting of MOSFETS, diodes and optoisolators. Only one device, a test sample, was tested. The OMR9701 parts had the following label:

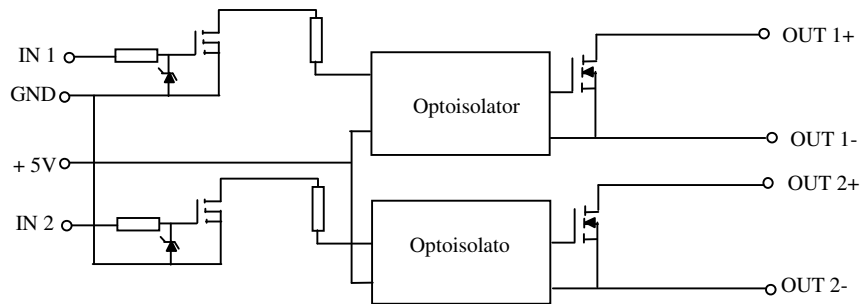


Figure 1. Block diagram of the OMR9701 Solid State Relay

2. Test Facilities

Facility: Texas A&M University Cyclotron Single Event Effects Test Facility,
Energy: 15 MeV/amu tune.
Flux: 1.0×10^3 to 1.3×10^5 particles/cm²/s.

Only one device was tested at the Texas A&M University Cyclotron Facility (TAMU). The part was tested with two ion beams incident normal to the device. The relevant parameters are given in Table 1.

Table 1.
Ion-beam Parameters

Ion	Energy	Range (μm)	LET(MeV.cm ² /mg)
Ar	497	175	8.68
Kr	917	116	29.3

3. Test Configuration

The part was tested in two configurations, output on and output off. The supply was set at 5 V. Proper testing necessitated the use of a 75 V load on the output that drew 4.5 A when turned on. To detect and capture SEEs, an oscilloscope was attached to the relay's output. The oscilloscope's trigger was set for 70 V when the device was off and 5 V when the device was on. In all cases, an input of 5 V with a current on less than 1 mA was used.

4. Results

Table II lists the beam parameters and the results. No SEEs of any kind were observed during testing. Table III lists the electrical parameters used for the different test runs.

Table II
Beam Parameters and Results

Run #	Device #	Ion	LET (MeV.cm ² /mg)	Angle	Flux ions/cm ² /s	Fluence	SEEs
1	1	Ar	8.68	0	1.57x10 ⁴	1 x 10 ⁷	None
2	1	Ar	8.68	0	1.55 x10 ⁴	1 x10 ⁷	None
3	1	Kr	29.3	0	9.87 x10 ⁴	1 x10 ⁷	None
4	1	Kr	29.3	0	1.02 x10 ⁵	1 x10 ⁷	None

Table II
Electrical Conditions

Run #	On/Off	Flux	Total dose	Load Voltage	Load Current	Supply Voltage/Current	Input Voltage/Current	Scope Trigger
1	Off	4.24E+04	1.39krad	75	4.5	5V/<1mA	5V/<1mA	70V
2	On	4.32E+04	1.39krad	75	4.5	5V/10mA	5V/<1mA	5V
3	Off	Varied	4.8 krad	75	4.5	5V/<1mA	5V/<1mA	70V
4	On	1.00E+05	4.8 krad	75	4.5	5V/10mA	5V/<1mA	5V

5. Conclusion

The part is not sensitive to single-event effects with heavy ions up to an effective LET of 29.3 MeV.cm²/mg.

6. Recommendations

In general, devices are categorized based on heavy ion test data into one of the four following categories:

Category 1 – Recommended for usage in all NASA/GSFC spaceflight applications.

Category 2 – Recommended for usage in NASA/GSFC spaceflight applications, but may require mitigation techniques.

Category 3 – Recommended for usage in some NASA/GSFC spaceflight applications, but requires extensive mitigation techniques or hard failure recovery mode.

Category 4 – Not recommended for usage in any NASA/GSFC spaceflight applications.

The International Rectifier OMR9701 are currently considered a category 2 part because the highest LET used was 29 MeV.cm²/mg.